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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/530,507	Applicant(s) TIKKA ET AL.	
	Examiner Barbara Summons	Art Unit 2817	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3-10, 12 and 14-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12, 14, 15 and 23-25 is/are allowed.
- 6) ☒ Claim(s) 3-10 and 16-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 April 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

New Grounds of Claim Objections and Resultant Drawing Objection

1. Claims 8 and 25 are objected to because of the following informalities:

In claim 8, on the next to last line thereof, the Examiner believes "integrated into the multilayer substrate" should more appropriately be - - integrated onto the multilayer substrate - -, since it is unclear how acoustic resonators would be integrated "into" a multilayer substrate and still be capable of functioning via their acoustic vibration, which requires movement, that would be restricted by the surrounding layers of the multilayer substrate.

Similarly, in claim 25, on line 2 thereof, it is believed that "into" should be changed to - - onto - -.

If "integrated into the multilayer substrate" is indeed Applicants' intended meaning, the following drawing objection is made.

Appropriate correction is required.

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "at least one" resonator "integrated into the multilayer substrate" as recited in claims 8 and 25, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended

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replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Withdrawn Claim Rejections - 35 USC § 103

3. Applicants' amendment received 6/5/07 has overcome all of the prior rejections, and they are therefore, withdrawn.

New Grounds of Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 7, 16 and 21 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 is unclear because it depends from a canceled claim (claim 2). Claim 7 is also unclear because it recites "the carrier substrate", which lacks antecedent basis in any of the claims, and wherein it is unclear how the "carrier substrate" relates to the "multilayer substrate" recited in independent claim 8, assuming that claim 8 is the claim from which claim 7 was intended to depend.

Similarly, claim 16 recites "a carrier substrate", wherein it is unclear how the "carrier substrate" relates to the previously recited "multilayer substrate" (see claim 8), which then renders unclear the location of the capacitor and resonator that were previously recited as "integrated into the multilayer substrate" (claim 8, last three lines).

Claim 21 also recites "the carrier substrate" and so is unclear for the same reasons discussed above.

For all any art rejections that may follow, the Examiner will assume that "the carrier substrate" and "the multilayer substrate" are one and the same, so that the claims would at least be clear as to the location of the capacitor and the resonator, and so as not to require a further drawing objection requiring that both the claimed distinct substrate structures be shown.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 5, 7-10, 16, 21 and 22 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nishimura et al. WO 02/093763 (see also equivalent U.S. 6,885,260 provided as an English language translation) in view of Tikka et al. U.S. 7,194,247.

Regarding claims 5, 8, 9 and 16, Figs. 10, 11A, 13 and 14B of Nishimura et al. disclose a filter 110 comprising bulk acoustic wave (BAW) resonators 111-115 each of the resonators comprising: a lower layer region comprising an electrode 18 (see Fig. 5) and including an acoustic mirror 30 that inherently has alternating layers with different acoustic impedances by definition of an acoustic mirror; an upper layer region comprising a second electrode 20 (Fig. 5); and a piezoelectric layer 12 between the electrodes; a capacitor C1 (Fig. 11A) is part of matching circuit 150 (Fig. 10) and is connected in series with the filter 110 and hence is connected in series with only the first resonator 111 thereof (see Figs. 13 and 10); and a multilayer substrate 16, wherein the resonators are integrated "into" (i.e. on in Fig. 13) the multilayer substrate, and wherein the capacitor C1 is integrated into the multilayer substrate (see Fig. 13) and comprises structured metal layers within the multilayer substrate (see also Fig. 14B).

Regarding claims 7 and 21, see Fig. 4 wherein the multilayer/carrier substrate may include an air gap under the resonators rather than an acoustic mirror. Regarding claims 10 and 22, the entire device including the other filter 130 is a duplexer.

However, Nishimura et al. discloses the resonators arranged as ladder filters and not as lattice filters or a stacked crystal filter.

Tikka et al. provides evidence that it is known to alternatively use lattice filter arrangements in place of ladder filters in acoustic wave filter duplexers including similar matching circuits (see e.g. Tikka Fig. 1 vs. Fig. 3), because the differential (i.e. balanced) operation of lattice arrangement filters provide certain advantageous benefits of better electrical performance and reduced insertion loss and higher stopband attenuation (see col. 2, lines 5-15).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the BAW resonator filter duplexer of Nishimura et al. (Figs. 10 and 13) by having replaced the ladder filters with lattice filters, because such an obvious modification would have been the mere substitution of art recognized alternative BAW filter structures, as implicitly suggested by Nishimura et al. which indicates that its ladder filters are only a "general technique of using the acoustic resonator to constitute the band filter" (see U.S. 6,885,260 col. 9, lines 30-32), and because the well known alternative lattice filter technique suggested by the exemplary teaching of Tikka et al. (see Fig. 1 vs. Fig. 3) would have provided advantageous benefits of better electrical performance, reduced insertion loss and increased stopband attenuation, as suggested by Tikka et al. (see col. 2, lines 5-15), wherein the choice of

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filter topology would have been dependent upon the filter performance specifications, such as required insertion loss and stopband attenuation, required for each individual intended use, as would have been known by one of ordinary skill in the art.

8. Claims 3, 4, 6 and 17-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nishimura et al. WO 02/093763 in view of Tikka et al. U.S. 7,194,247 as applied to claim 8 above, and further in view of Klee et al. U.S. 2001/0048352 (of record).

The Nishimura/Tikka combination discloses the invention as discussed above, except for both or at least one of the upper and lower layer regions including a plurality of layers of different materials, and regarding claims 6 and 20, one of the acoustic mirror layers comprising an electrode layer, and regarding claim 19, acoustic mirrors being provided both in the upper and lower layer regions.

Klee et al. discloses that it would have been extremely well known in the BAW resonator filter art to form the electrodes of multiple layers of different materials, e.g. Ti/Pt or Ti/Pt/Al or Ti/Ag, etc. (see e.g. section [0039]) and to have an acoustic mirror with one of the layers being an electrode layer (see section [0065], the last three lines thereof), and to provide acoustic mirrors both above as well as below the resonators (see section [0066]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the BAW filter/duplexer of the Nishimura/Tikka combination by having: (1) used multilayer electrodes; or (2) used multiple layer acoustic mirrors with one of the layers providing the electrodes; or to (3) have provided

an acoustic mirror in the upper layer region in addition to the one already provided in the lower layer region in place of the filter lids 110a/130a (Fig. 13), because such obvious modifications as suggested by the exemplary teaching thereof by Klee et al. (sections [0039], [0065], last three lines, and [0066]), would have been: regarding (1) the mere substitution of art recognized alternative electrode structures wherein multilayer electrodes would have been extremely well known to provide the required density, mass loading, and acoustic velocity required for the resonators in each individual application, and furthermore Ti would have been a well known adhesion layer providing adhesion of the, e.g., Pt electrode layer to the piezoelectric layer; regarding (2) would have been merely the advantageous double-duty use of a layer of the acoustic mirror for the additional purpose of an electrode layer, providing the benefit of fewer manufacturing steps and a cheaper device since a distinct further electrode layer need not be formed; and regarding (3) an upper acoustic mirror in place of filter lids/covers would have been merely the substitution of an art recognized alternative packaging structure well known by one of ordinary skill in the art, as evidenced by Klee (section [0066]) for providing the necessary protection of such BAW resonators from environmental factors.

Allowable Subject Matter

9. Claims 12, 14, 15 and 23-25 are allowable over the prior art of record.

Response to Arguments

10. Applicant's arguments with respect to claim 8 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Nishimura et al. U.S. 6,885,260 is cited as an English language equivalent document of the PCT document applied above.

Metzger et al. U.S. 6,927,649 has common inventors and a common assignee with the instant application and discloses BAW resonators formed on a multilayer substrate MS (see Figs. 1-4) or on a carrier substrate SU mounted on a multilayer substrate (see Figs. 5-8) wherein capacitors connected to the BAW resonators are formed as integrated circuits IE inside the multilayer substrate (see col. 7, lines 41-46).

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The Penunuri et al. article "RF Filter Design Using LTCC and Thin Film BAW Technology" discloses a filter including 3 capacitors (see page 275, left column, the first full paragraph) formed in the multiple LTCC layers (see also Fig. 3, and see Fig. 2 which is unclear as to the location of the capacitors in the filter equivalent circuit).

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barbara Summons whose telephone number is (571) 272-1771. The examiner can normally be reached on M-Th, M-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 271-1769. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

bs
August 20, 2007



BARBARA SUMMONS
PRIMARY EXAMINER